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ANTIVENOMOUS PLANTS USED IN THE ZAIREAN PHARMACOPOEIA

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ABSTRACT Ethnobotanical inquiries were made in Zaire to collect plants traditionally used for treatment of envenomations. As a result, a checklist of 109 antivenomous plants is presented with their scientific and vernacular names, the locality and the directions for use for each plant.

The Zairean antivenomous plants are grouped in three categories: the repulsive, the protective and the curative plants. The part used depends on the structure of the plant. For trees and shrubs, barks and roots are used. Sometimes leaves, fruits and flowers may be collected. For herbaceous plants, the whole plant is used. Drugs (decoction, infusion and maceration) are administered to the victim orally or externally.

INTRODUCTION

The use of plants for treatment of various diseases has been practised by many African peoples for centuries (Kokwaro, 1976). Because of many mortal accidents caused by snake bites, people looked for medicine and discovered after many tentative efforts that plants are able to stop envenomations. Thus the antivenomous plants were introduced in the traditional pharmacopoeia.

In Zaire, antivenomous plants are not well known by the public because they constitute one of the links of medical secret of the traditional medicine men. Because numerous mortal snake bites are recorded in Zaire (Chifundera, 1985), we have undertaken the research on the antivenomous plants. We present here the first result by giving the checklist of some 109 plants used in the Zairean pharmacopoeia.

Ethnobotanical inquiries were made to obtain local plants, their vernacular names and the directions for use of each plant.

In Zairean religious thoughts, the snakes are considered as animals which cause fear. According to a particular context as in legends, the snake brings happiness or misfortune. In many countries the snake represents the essence of life. For this reason it is associated to the creation of mankind. For instance, snakes of the genus *Bitis* are used in the traditional ceremony of enthroning the Great Customary Chief (Chifundera, 1979).

The caste of snake charmers is well known in Zaire and in many other countries of Africa. They handle without fear the dangerous cobras and mambas. Little information exists about the methods of handling the snakes. However, we know after many investigations that in many provinces the charmer is immunized against snake venom by pricks of gradual doses. In other regions, venomous hooks are removed. Sometimes the harmless (Colubrids) are handled.

We have also seen that many tribes consume the flesh of large snakes. The skin is sold to specialized craftsmen for making girdles, bags and many other ornamental objects. In therapeutics, the skin, hooks and fat are used for treating rheumatism and inflammatory pains.

On the other hand, herpetological knowledges in the traditional areas are purely empirical.

By an experience of a long time the classification and the nomenclature were built. The species of snakes are distinguished by their coloration, their biotope, their size and the pattern of the head or of the body. According to such nomenclature, however, many difficulties exist because of the confusions between the colours. That is why the same name can designate several snakes having the same colour. The hunting of poisonous snakes are killed or captured with zoocidal materials (extract of plants) and snares. Magic formulas, immunization by gradual doses of venom and use of antivenomous plants, are preventive methods against bites and treat eventual envenomation from poisonous snakes.

The listing of poisonous animals known in the traditional areas has one principal objective, i.e. for canalizing our investigations on the antidotes of the venom from all poisonous animals.

METHODS

General interview technics, i.e. conversation with medicine men, were used. Botanical description was previously made for each plant and locality. vernacular names and directions for use indicated. Scientific identification and botanical systematics were made in the Botanical Laboratory of CRSN Lwiro and in the INERA's Herbarium of Kinshasa University. The inventory covered all the provinces, but the eastern region (Kivu) was the most studied. A general review of literature was made for further information concerning the directions of use of antivenomous plants in other countries of Africa.

TRADITIONAL UTILIZATION OF PLANT DRUGS AGAINST THE SNAKE BITES

As listed in Tables 1 and 4, about 109 antivenomous plants are used in the Zairean pharmacopoeia. According to the reliable information we observe these:

- (1) Out of the 109 plants, 39 are also most used traditionally for treatment of envenomations in several countries of Africa (Bazarusanga, 1960; Haerdi, 1964; Kerharo and Adam, 1964; Kokwaro, 1976; Chifundera, 1980). Many antivenomous plants are known particularly from Central and East Africa (Table 2, 3).
- (2) Two plants used in Zaire are also utilized in other countries of Africa and India: *Ocimum sanctum* and *Cissampelos pareira* (Wildeman et al., 1939).
- (3) One plant used in Zaire is known as antidote of venom in West Africa and in Latin America (Amerindians): *Polygala senega* (Schnell, 1949).
- (4) Two plants are already used in modern medicine: *Strychnos pungens* and *Strychnos spinosa* (Burette, 1947).
- (5) The directions for use and classification according to the type of envenomation are the same in many localities of Zaire and this can be observed also in many other countries of Africa (Kokwaro, 1976; Adjanohoun, 1980).

The antivenomous plants are grouped in three categories: the repulsive, the protective and the curative plants.

Repulsive plants: Numerous tribes of Zaire use the extract of some plants as snake repellent.

Protective plants: Several plants are used for immunization and some of them are used like a protective bracelet.

Curative plants: Antivenomous phytotherapy is known from several tribes. When a man is bitten by a poisonous animal, the plant extracts are used. People administrate the drug to the victim orally or externally (decoction, infusion, maceration and draught). The observation of real recovery cases suggests that antivenomous principles can be found in some plants.

Table 1. Checklist of Zairean antivenomous plants (40 families, 74 genera, 109 species).

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1. Acanthaceae (3 genera, 3 species)
 1. *Brillantaisia cicatricosa* LINDAU
 2. *Dicliptera* sp.
 3. *Dyschoriste perrotetii* KUNTZE
 2. Amaranthaceae (1 genus, 1 species)
 4. *Amaranthus* sp. (aspera ?)
 3. Amaryllidaceae (2 genera, 2 species)
 5. *Crinum ornatum* AIT.
 6. *Haemanthus* sp.
 4. Annonaceae (1 genus, 3 species)
 7. *Annona arenaria* THONN.
 8. *Annona nana* EXELL.
 9. *Annona senegalensis* PERS.
 5. Apocynaceae (5 genera, 9 species)
 10. *Alstonia congensis* ENGL.
 11. *Diplorhynchus mossambicensis* BENTH.
 12. *Funtumia elastica* STAPF
 13. *Rauwolfia cambodiana* (perakensis KING & GAMBLE)
 14. *Rauwolfia heterophylla* WILLD.
 15. *Rauwolfia javanica* KOORDERS & VAHL
 16. *Rauwolfia serpentina* BENTH.
 17. *Rauwolfia vomitoria* AFZEL
 18. *Strophanthus hispidus* DC.
 6. Asteraceae (8 genera, 9 species)
 19. *Ageratum conyzoides* LINNE
 20. *Bidens pilosa* LINNE
 21. *Crassocephalum bumbense* MOORE
 22. *Crassocephalum vitellinum* MOORE
 23. *Dichrocephala integrifolia* KUNTZE
 24. *Mikania cordata* ROBINSON
 25. *Senecio stuhlmanii* KLATT
 26. *Spilanthes mauritiana* DC.
 27. *Vernonia conferta* BENTH.
 7. Balsaminaceae (1 genus, 2 species)
 28. *Impatiens masisiensis* DeWILD.
 29. *Impatiens* sp.
 8. Caesalpiniaceae (2 genera, 3 species)
 30. *Cassia alata* LINNE
 31. *Cassia occidentalis* LINNE
 32. *Erythrophleum guineense* DON.
 9. Clusiaceae (2 genera, 3 species)
 33. *Harungana madagascariensis* LAM. ex POIR.
 34. *Harungana* sp. (paniculata?)
 35. *Lebrunia bushaie* STANER
 10. Commelinaceae (2 genera, 3 species)
 36. *Commelina* sp.
 37. *Palisota ambigua* CLARKE
 38. *Palisota hirsuta* THUNB.
 11. Convolvulaceae (1 genus, 1 species)
 39. *Merremia tridentata* HALLIER.
 12. Crassulaceae (1 genus, 1 species)
 40. *Kalanchoe integra* KUNTZE
 13. Cucurbitaceae (2 genera, 2 species)
 41. *Melothria punctata* COGN.
 42. *Zehneria scabra* SOND.
 14. Ebenaceae (1 genus, 2 species)
 43. *Diospyros honleana* WHITE
 44. *Diospyros* sp.
 15. Euphorbiaceae (2 genera, 3 species)
 45. *Alchornea* sp.

46. *Hymenocardia acida* TUL.
 47. *Hymenocardia heudelotii* MULL.
16. Fabaceae (3 genera, 3 species)
 48. *Alysicarpus zeyheri* HARV & SOND.
 49. *Desmodium adscendens* DC.
 50. *Lonchocarpus bussei* HARMS
17. Flacourtiaceae (1 genus, 1 species)
 51. *Caloncoba glauca* GILG.
18. Lamiaceae (1 genus, 3 species)
 52. *Ocimum americanum* LINNE
 53. *Ocimum lamellifolium* HOCHST ex BENTH.
 54. *Ocimum sanctum* LINNE
19. Lauraceae (1 genus, 1 species)
 55. *Cassytha filiformis* LINNE
20. Liliaceae (3 genera, 6 species)
 56. *Aloe lateritia* ENGL.
 57. *Anthericum elgonense* BULLOCK
 58. *Anthericum* sp.
 59. *Asparagus africanus* LAM.
 60. *Asparagus racemosus* WILLD.
 61. *Asparagus wildemanii* WEIM.
21. Linaceae (1 genus, 3 species)
 62. *Hugonia arborescens* MILDBR.
 63. *Hugonia platysepala* WELW. ex OLIV.
 64. *Hugonia* sp.
22. Loganiaceae (1 genus, 3 species)
 65. *Strychnos* sp. (*hispidus* ?)
 66. *Strychnos pungens* SOLERED
 67. *Strychnos spinosa* LAM.
23. Malvaceae (2 genera, 3 species)
 68. *Hibiscus cannabinus* LINNE
 69. *Hibiscus fuscus* GARCKE
 70. *Sida rhombifolia* LINNE
24. Menispermaceae (2 genera, 5 species)
 71. *Cissampelos mucronata* RICH.
 72. *Cissampelos pareira* LINNE
 73. *Cissampelos owariensis* BEAUV.
 74. *Jateorhiza palmata* MIERS
 75. *Jateorhiza strigosa* MIERS
25. Mimosaceae (2 genera, 3 species)
 76. *Acacia* sp.
 77. *Dichrostachys glomerata* CHIOV.
 78. *Dichrostachys nutans* BENTH.
26. Myrsinaceae (1 genus, 1 species)
 79. *Maesa lanceolata* FORSK
27. Oxalidaceae (1 genus, 1 species)
 80. *Oxalis corniculata* LINNE
28. Piperaceae (1 genus, 2 species)
 81. *Piper capense* LINNE
 82. *Piper umbellatum* LINNE
29. Poaceae (5 genera, 6 species)
 83. *Panicum maximum* JACQ.
 84. *Paspalum conjugatum* BERG.
 85. *Pennisetum purpureum* SCHUM.
 86. *Setaria chevalieri* STAPF
 87. *Setaria megaphylla* DUREN
 88. *Sporobolus pyramidalis* BEAUV.
30. Polygalaceae (1 genus, 2 species)
 89. *Polygala* sp. (*senega*?)
 90. *Polygala ruwenzoriensis* CHODAT

31. Rosaceae (1 genus, 1 species)
91. *Rubus apetalus* POIR.
32. Rubiaceae (4 genera, 4 species)
92. *Chomelia laurentii* WILD.
93. *Geophila* sp.
94. *Pentas deweyrei* WILD. & DUREN
95. *Rubia cordifolia* LINNE
33. Sapindaceae (1 genus, 2 species)
96. *Allophyllus africanus* BEAUV.
97. *Allophyllus* sp.
34. Simaroubaceae (1 genus, 1 species)
98. *Harrisonia abyssinica* OLIV.
35. Solanaceae (1 genus, 1 species)
99. *Capsicum frutescens* LINNE
36. Thymelaeaceae (1 genus, 1 species)
100. *Dicranolepis oligantha* GILG.
37. Urticaceae (2 genera, 4 species)
101. *Ureria cameroonensis* WEDD.
102. *Ureria hypselodendron* WEDD.
103. *Ureria* sp. (*repens* ?)
104. *Urtica massaica* MILDBR.
38. Verbenaceae (1 genus, 1 species)
105. *Clerodendrum glabrum* MEYER
39. Vitaceae (1 genus, 2 species)
106. *Cissus afzeli* GILG. & BRANDT
107. *Cissus debilis* PLANCHER
40. Zingiberaceae (1 genus, 2 species)
108. *Aframomum laurentii* BOUILLIENNE
109. *Aframomum sanguineum* SCHUM.

Table 2. Regional repartition of antivenomous plants in Zaire.

Regions	Number of plants	Percentage
Kivu	65	59.6
Bas-Zaire, Bandundu	13	
Shaba	9	40.4
Kasai (Eastern and Western)	8	
Haut-Zaire	9	
Equateur	5	
Zaire	109	100

Table 3. Geographical repartition of antivenomous plants in Africa.

Regions	Family	Genus	Species
Zaire	40	74	109
Central Africa	34	55	73
East Africa	59	128	165
West Africa	27	47	55
South Africa	5	5	7
Africa	79	232	344

Table 4. List of antivenomous plants (locality, vernacular name, directions for use).

1. *Acacia* sp. (Mimosaceae)
Locality: Irangi (Kalehe, Kivu).
Vernacular name: Lukerere (Kitembo).
Directions for use: Add water to the powder and drink two spoonfuls.
2. *Aframomum laurentii* BOUILLENNE (Zingiberaceae)
Locality: Bunyakiri (Kalehe, Kivu).
Vernacular names: Bitakungurwa (Mashi), Bosoombo (Mongo), Matungulu (Kirega).
Directions for use: Rub the snake bite with paste or juice of roots.
3. *Aframomum sanguineum* SCHUM. (Zingiberaceae)
Locality: Lwiro, Buloli, Kabare in the humid places, East Africa.
Vernacular names: Bitakungurwa (Mashi), Matungulu (Kirega).
Directions for use: Drink decoction of roots or cover the bite with paste prepared with peeled fruits, young shoots in mixture of salt added to *Oxalis corniculata*.
4. *Ageratum conyzoides* LINNE (Asteraceae)
Locality: Nyakadaka, Kabare, Walungu.
Vernacular name: Kahyole (Mashi).
Directions for use: Drink maceration or juice of the whole plant.
5. *Achornea* sp. (Euphorbiaceae)
Locality: Itebero, Kamituga, Kabunga (Walikale).
Vernacular name: Katumbanyi (Kirega), Umukomompiri (Kinyarwanda).
Directions for use: Use a bit of wood like an adhesive on the bite.
6. *Allophyllus africanus* BEAUV. (Sapindaceae)
Locality: Ruzizi, Tshibinda in the savanna.
Vernacular names: Kashushumuhanda (Mashi), Mutulituli (Kitembo)
Directions for use: Drink maceration of roots or use a bit of wood like an adhesive on the bite.
7. *Allophyllus* sp. (Sapindaceae)
Locality: Bunyakiri.
Vernacular names: Kashushumuhanda (Mashi), Mutulituli (Kitembo).
Directions for use: Drink maceration or use a bit of stem like an adhesive on the bite.
8. *Aloe lateritia* ENGL. (Liliaceae)
Locality: Lwiro, Kabare, Shaba.
Vernacular names: Chizimya-muliro (Mashi), Kishinie-shinie (Tshiluba).
Directions for use: Drink maceration of leaves.
9. *Alstonia congensis* ENGL. (Apocynaceae)
Locality: Walikale, West Africa.
Vernacular name: Mutongo (Kitembo).
Directions for use: Drink aqueous extract of the whole plant.
10. *Alysicarpus zeyheri* HARV. & SOND. (Fabaceae)
Locality: Mayumbe, Shaba, Tanzania.
Vernacular names: Salobokombo (Kiyombe), Ngandu (Mashi), Kiteleka (Kimbunga from Tanzania).
Directions for use: Drink extract of roots.
11. *Amaranthus* sp. (*aspera* ?) (Amaranthaceae)
Locality: Bunyakiri.
Vernacular names: Lengalenga (Kingwana), Ntendebuka (Mashi).
Directions for use: Decoction of young leaves is used for vaccination.
12. *Annona arenaria* THONN. (Annonaceae)
Locality: Ruzizi, near the Sange river.
Vernacular names: Kitobi (Kifulero), Lukwangu (Kitembo), Lolo (Kikongo), Kilololo (Tshiluba), Bonenge-na-esobe (Lingala).
Directions for use: Immunization is obtained with decoction of roots or with maceration of leaves and barks.
13. *Annona nana* EXELL. (Annonaceae)
Locality: Katuba (Shaba), Zambezia.
Vernacular names: Mulolo (Tshiluba), Lukwangu (Kitembo).
Directions for use: Use decoction of roots or aqueous extract of powdered leaves and barks.
14. *Annona senegalensis* PERS. (Annonaceae)
Locality: Shaba, Zambezia.

- Vernacular name: Mulolo (Tshiluba).
Directions for use: Drink aqueous extract of powdered barks.
15. *Anthericum elgonense* BULLOCK (Liliaceae)
Locality: Kabare, Walungu.
Vernacular names: Irago, Chiragorago-ch'emuzirhu (Mashi).
Directions for use: Drink extract of the whole plant.
 16. *Anthericum* sp. (Liliaceae)
Locality: Kabare.
Vernacular names: Irago nyarubasa, Irago Ruzuba, Nyakahungula (Irago lufungula, Irago (Mashi)).
Directions for use: Drink maceration of leaves or of the whole plant, masticate leaves for protection or rub the bite with juice.
 17. *Asparagus africanus* LAM. (Liliaceae)
Locality: Ruzizi.
Vernacular names: Kashasha, Hinyamigenge (Mashi), Barakuli (Azande), Umushabishabi (Kinyarwanda).
Directions for use: Drink maceration of roots or sprinkle the bite with powder of the whole plant.
 18. *Asparagus racemosus* WILLD. (Liliaceae)
Locality: Lwiro.
Vernacular name: Hinyamigenge (Mashi).
Directions for use: Drink maceration of roots or sprinkle the bite with powder of the whole plant.
 19. *Asparagus wildemanii* WEIM. (Liliaceae)
Locality: Kabare, Ruzizi.
Vernacular name: Hinyamigenge (Mashi).
Directions for use: Drink maceration of roots or sprinkle the bite with powder of the whole plant.
 20. *Bidens pilosa* LINNE (Asteraceae)
Locality: Lwiro, Walungu, Tanzania.
Vernacular names: Kashisha (Mashi and Kitembo), Nanzwenzwe (Kihehe).
Directions for use: Drink aqueous extract of the whole plant.
 21. *Brillantaisia cicatricosa* LINDAU (Acanthaceae)
Locality: Lwiro, Kabare, Kalehe.
Vernacular names: Mushegemanjoka (Mashi), Ikirogora (Kinyarwanda).
Directions for use: Maceration of leaves drunk.
 22. *Caloncoba glauca* GILG. (Flacourtiaceae)
Locality: Haut-Zaire.
Vernacular name: Kuma (Azande).
Directions for use: Drink aqueous extract of the whole plant.
 23. *Capsicum frutescens* LINNE (Solanaceae)
Locality: Lwiro.
Vernacular names: Piripiri (Mashi), Pilipili (Kswahili).
Directions for use: Maceration of the whole plant drunk.
 24. *Cassia alata* LINNE (Caesalpiniaceae)
Locality: Kisantu, Kisangani, Musenge, Walikale.
Vernacular name: Mokolo (Azande).
Directions for use: Maceration of fresh leaves drunk.
 25. *Cassia occidentalis* LINNE (Caesalpiniaceae)
Locality: Zaire, (Lwiro). East Africa, West Africa, Central Africa.
Vernacular names: Mwengajini (Kiswahili), Mushegemanjoka (Mashi), Umuyoka, Kisogera (Kinyarwanda), Matsambisambi (Kikongo).
Directions for use: Maceration of fresh leaves drunk.
 26. *Casytha filiformis* LINNE (Lauraceae)
Locality: Lwiro, Walungu.
Vernacular name: Imererhahaha (Mashi).
Directions for use: Drink maceration of the whole plant.
 27. *Chomelia laurentii* WILD. (Rubiaceae)
Locality: Boma, Aruwimi,
Vernacular name: ?

- Directions for use: Drink maceration or rub the bite with triturated plant.
28. *Cissampelos mucronata* RICH. (Menispermaceae)
 Locality: Kabare, Katana, Tanzania, West Africa.
 Vernacular names: Iruhulambwire, Kahulula (Mashi), Lukija (Kihehe) Ngolomar (Wolof from Ivory Coast).
 Directions for use: Maceration to drink or rub the bite with extract of leaves.
 29. *Cissampelosowariensis* BEAUV. (Menispermaceae)
 Locality: Shaba, Lwiro, Ghana, Tanzania.
 Vernacular names: Lukija (Kihehe), Lusumvu (Tshiluba), Kahulula (Mashi).
 Directions for use: Rub the bite with maceration of the whole plant.
 30. *Cissampelos pareira* LINNE (Menispermaceae)
 Locality: Lwiro, Tanzania, RSA, India, Nigeria.
 Vernacular names: Kahulula (Mashi), Lukija (Kihehe).
 Directions for use: Rub the bite with maceration of the whole plant.
 31. *Cissus afzeli* GILG. & BRANDT (Vitaceae)
 Locality: Uele.
 Vernacular name: Kigobgo (Azande).
 Directions for use: Drink aqueous extract of powdered roots.
 32. *Cissus debilis* PLANCH. (Vitaceae)
 Locality: Mayombe, Yangambi.
 Vernacular names: Bilombozi (Kikongo), Nagbinikele (Ngwaka).
 Directions for use: Drink aqueous extract of powdered leaves and roots.
 33. *Clerodendrum glabrum* MEYER (Verbenaceae)
 Locality: Lwiro.
 Vernacular name: Omukuza-nyana (Mashi).
 Directions for use: Maceration of leaves and roots drunk.
 34. *Commelina* sp. (Commelinaceae)
 Locality: Bunyakiri.
 Vernacular names: Irago Kangomwe, Mudege (Mashi).
 Directions for use: Drink maceration, rub the bite with sap or sprinkle the bite with mixture of ashes and *Panicum maximum*.
 35. *Crassocephalum bumbense* MOORE (Asteraceae)
 Locality: Irangi, Lwiro, East Africa.
 Vernacular name: Kifubula (Mashi).
 Directions for use: Drink aqueous extract of the whole plant.
 36. *Crassocephalum vitellinum* MOORE (Asteraceae)
 Locality: Lwiro, Katana, Walungu.
 Vernacular names: Nshununu, Nshungululu (Mashi).
 Directions for use: Aqueous extract of the whole plant is ophiocid.
 37. *Crinum ornatum* AIT. (Amaryllidaceae)
 Locality: Katana.
 Vernacular names: Irago, Irago kamagiri (Mashi).
 Directions for use: Use scales of bulbs.
 38. *Desmodium adscendens* DC. (Fabaceae)
 Locality: Kabare, Walungu, Tanzania.
 Vernacular name: Yenyemangogo (Kihehe).
 Directions for use: Vaccine prepared with decoction of young leaves.
 39. *Dichrocephala integrifolia* KUNTZE (Asteraceae)
 Locality: Kivu, Tanzania.
 Vernacular names: Chitundambuga (Mashi), Kitindambwa (Kitembo).
 Directions for use: Rub the bite with decoction prepared with mixture of *Paspalum conjugatum*.
 40. *Dichrostachys glomerata* CHIOV. (Mimosaceae)
 Locality: Kabare near the Kivu Lake, Rwindi, Senegal.
 Vernacular names: Nanga (Azande), Luvagu (Kiyombe), Lusolo (Kibemba), Nsende Nkanga (Kikongo), Umukamba (Kinyarwanda), Kaurton (Soce from Senegal).
 Directions for use: Decoction or maceration of leaves and barks are used internally.
 41. *Dichrostachys nutans* BENTH. (Mimosaceae)
 Locality: Kivu, Rwanda.
 Vernacular name: Umuramba (Kinyarwanda).
 Directions for use: Maceration or decoction of leaves and roots drunk.

42. *Dicliptera* sp. (Acanthaceae)
 Locality: Maziba, Lwiro, Lubona, Walungu.
 Vernacular names: Mpindula, Magaru (Mashi).
 Directions for use: Drink maceration of the whole plant.
43. *Dicranolepis oligantha* GILG. (Thymelaeaceae)
 Locality: Bunyakiri.
 Vernacular names: Litabuta, Lulimbo (Kitembo).
 Directions for use: Drink aqueous extract of the whole plant or sprinkle the bite with ashes.
44. *Diospyros honleana* WHITE (Ebenaceae)
 Locality: Kalehe, Kabare.
 Vernacular names: Kabungo (Kitembo), Mugiranyana (Kinyarwanda).
 Direction for use: Drink aqueous extract of the whole plant or rub the bite with decoction.
45. *Diospyros* sp. (Ebenaceae)
 Locality: Bunyakiri.
 Vernacular name: Kabungo (Kitembo).
 Directions for use: Drink aqueous extract of the whole plant.
46. *Diplorhynchus mossambicensis* BENTH. (Apocynaceae)
 Locality: Maniema, East Africa.
 Vernacular name: Muenge (Kibemba).
 Directions for use: Drink extract of barks or sprinkle the bite with decoction.
47. *Dyschoriste perrotetii* KUNTZE (Acanthaceae)
 Locality: Kabare, Walungu.
 Vernacular names: Chumumwe (Mashi), Urusogo, Urubigija (Kinyarwanda).
 Directions for use: Vaccine is prepared with decoction of young leaves.
48. *Erythrophleum guineense* DON. (Caesalpiniaceae)
 Locality: Bunyakiri, Shabunda, Walikale, East Africa.
 Vernacular names: Ishega (Kirega), Ishea (Kitembo), Ngere (Azande) Gbanda (Ngombe).
 Directions for use: Maceration of the whole plant drunk.
49. *Funtumia elastica* STAPF (Apocynaceae)
 Locality: Bunyakiri, Tanzania.
 Vernacular names: Nguhale (Kitembo), Mukomandumbili (Kihehe).
 Directions for use: Vaccine is made with decoction of young leaves.
50. *Geophila* sp. (Rubiaceae)
 Locality: Irangi.
 Vernacular name: ?
 Directions for use: Extract of the whole plant drunk.
51. *Haemanthus* sp. (Amaryllidaceae)
 Locality: Kabare, Walungu.
 Vernacular names: Kakanzi (Kinyarwanda), Irago (Mashi).
 Directions for use: Rub the sacrificed bite with triturated plant.
52. *Harrisonia abyssinica* OLIV. (Simaroubaceae)
 Locality: Beni, Semliki, Uele, East Africa.
 Vernacular names: Nkoromando (Kiswahili), Kilu (Uele), Bakiwe (Azande), Umufantangwe, Muganzacaro (Kinyarwanda).
 Directions for use: Maceration of leaves and roots drunk.
53. *Harungana madagascariensis* LAM. ex POIR. (Clusiaceae)
 Locality: Kabare, Muganzo, Bunyakiri, Irangi, Mwenga, Walungu.
 Vernacular names: Kadwamuko, Ndwamuko (Mashi).
 Directions for use: Maceration of the whole plant drunk.
54. *Harungana* sp. (*paniculata* ?) (Clusiaceae)
 Locality: Kivu, West Africa.
 Vernacular name: Ndwamuko (Mashi).
 Directions for use: Maceration of the whole plant drunk.
55. *Hibiscus camabinus* LINNE (Malvaceae)
 Locality: Bunyakiri, Burundi, East Africa.
 Vernacular names: Mukeranshungwe (Mashi), Uruberwa (Kirundi).
 Directions of use: Immunization is obtained with decoction of young leaves.
56. *Hibiscus fuscus* GARCKE (Malvaceae)
 Locality: Beni, Kabare, Walungu, East Africa.
 Vernacular names: Mukuma (Meru), Muderhe (Mashi), Urutete (Kinyarwanda).

- Directions for use: Drink decoction of roots or rub the bite with maceration made with mixture of *Pennisetum purpureum*.
57. *Hugonia arborescens* MILDBR. (Linaceae)
 Locality: Tanzania, Kisantu.
 Vernacular name: Lomboya lo fufow (Turumbu).
 Directions for use: Drink maceration or rub the sacrificed bite.
 58. *Hugonia platysepala* WELW. & OLIV. (Linaceae)
 Locality: Bunyakiri, Equateur, Shaba.
 Vernacular names: Masanga (Tshiluba), Mokonde (Mongo), Geke (Lingala), Rusimbambake (Kitembo), Botupi (Azande), Ifumbolo (Lingala).
 Directions for use: Immunization made with decoction of young leaves.
 59. *Hugonia* sp. (Linaceae)
 Locality: Beni, Kisantu.
 Vernacular name: Lomboya lo fufow (Turumbu).
 Directions for use: Drink maceration or rub the bite.
 60. *Hymenocardia acida* TUL. (Euphorbiaceae)
 Locality: Maniema, Bena-Muhona territory.
 Vernacular name: Kapemba (Kibemba).
 Directions for use: Add water to powder of roots in mixture of *Strychnos* sp. for drinking or sprinkle the bite with this maceration.
 61. *Hymenocardia heudelotii* MÜLL. (Euphorbiaceae)
 Locality: Maniema.
 Vernacular name: Kapemba (Kibemba).
 Directions for use: Drink aqueous extract of roots or sprinkle the bite with maceration.
 62. *Impatiens masisiensis* DeWILD. (Balsaminaceae)
 Locality: Bunyakiri.
 Vernacular name: Irhonda (Mashi).
 Directions for use: Drink juice or sprinkle the bite with it.
 63. *Impatiens* sp. (Balsaminaceae)
 Locality: Bunyakiri, Irangi.
 Vernacular names: Irhonda (Mashi), Etondo (Kitembo).
 Directions for use: Drink juice of fresh leaves, drink maceration or rub the bite with it.
 64. *Jateorhiza palmata* MIERS (Menispermaceae)
 Locality: Mayombe, Tanzania.
 Vernacular names: Madia-ngulu (Kiyombe), Chinyaboya (Kitembo), Esiel (Turumbu), Mweniponi (Kihehe).
 Directions for use: Sprinkle the sacrificed bite with juice.
 65. *Jateorhiza strigosa* MIERS (Menispermaceae)
 Locality: Mayombe, Lisala, Cameroon.
 Vernacular names: Madia-ngulu (Kiyombe), Esiel (Turumbu).
 Directions for use: Cover the sacrificed bite with juice.
 66. *Kalanchoe integra* KUNTZE (Crassulaceae)
 Locality: Bunyakiri.
 Vernacular names: Chikugwa, Lwandanda (Mashi), Kinenke (Kitembo).
 Directions for use: Immunization made with decoction of young leaves.
 67. *Lebrunia bushata* STANER (Clusiaceae)
 Locality: Bunyakiri, Walikale.
 Vernacular names: Bukerenge (Kitembo), Mushahi, Bushahi (Mashi).
 Directions for use: The oil is used like binding material in pastes.
 68. *Lonchocarpus bussei* HARMS (Fabaceae)
 Locality: Eala, East Africa.
 Vernacular names: Bobwate, Igogo (Lingala), agoio, Angbolo (Azande), Bolengeli (Kiyombe), Bontoko (Mongo).
 Directions for use: Drink maceration of the whole plant or use barks as tourniquet.
 69. *Maesa lanceolata* FORSK (Myrsinaceae)
 Locality: Lwiro, Walungu, Bunyakiri, Irangi.
 Vernacular names: Mparhi (Mashi), Mbacha (Kitembo).
 Directions for use: Drink maceration of fresh leaves.
 70. *Melothria punctata* COGN. (Cucurbitaceae)
 Locality: Kabare, Kalehe.

- Vernacular name: Kungukira (Mashi).
Directions for use: Drink maceration of the whole plant: one glass twice a day.
71. *Merremia tridentata* HALLIER (Convolvulaceae)
Locality: Tanzania, Senegal, Zaire.
Vernacular names: Mbaso (Ifakara), Dioulou n'digon (Socé).
Directions for use: Maceration of the whole plant drunk.
 72. *Mikania cordata* ROBINSON (Asteraceae)
Locality: Tanzania, Shabunda, Walikale.
Vernacular names: Bombo (Kirega), Lubungulu (Kimbunga).
Directions for use: Maceration of the whole plant drunk.
 73. *Ocimum americanum* LINNE (Lamiaceae)
Locality: Goma, Rutshuru, Tanzania, Kenya.
Vernacular names: Agndu (Azande), Kaharajiji (Mashi).
Directions for use: Maceration of leaves drunk.
 74. *Ocimum lamiiifolium* HOCHST. ex BENTH. (Lamiaceae)
Locality: Lwiro.
Vernacular name: Kaharajiji (Mashi).
Directions for use: Maceration of leaves drunk.
 75. *Ocimum sanctum* LINNE (Lamiaceae)
Locality: Kivu, Equateur, Inde.
Vernacular names: Lujinji, Kaharajiji (Mashi), Matsutsutshu (Lingala).
Directions for use: Drink maceration of leaves or squeeze juice of twigs.
 76. *Oxalis corniculata* LINNE (Oxalidaceae)
Locality: Lwiro, Ruzizi, Muganzo, Walungu.
Vernacular names: Mungo-mpese, Munyu-mpene (Mashi), Munyu-mbene (Kihunde), Munia-wa-mbene (Kinande).
Directions for use: Rub the wound with the maceration of the whole plant; Swallow juice of masticated plant; Make paste with mixture of this plant and *Aframomum sanguineum*, add the salt and cover the bite.
 77. *Palisota ambigua* CLARKE (Commelinaceae)
Locality: Irangi.
Vernacular name: Kikanzi (Kitembo).
Directions for use: Rub the bite with crushed leaves.
 78. *Palisota hirsuta* THUNB. (Commelinaceae)
Locality: Irangi.
Vernacular names: Kalume-ka-kikanzi, Chikanzi (Kitembo).
Directions for use: Rub the bite with maceration of leaves.
 79. *Panicum maximum* JACQ. (Poaceae)
Locality: Bunyakiri.
Vernacular names: Lwikobe (Kitembo), Kashinyungu (Mashi).
Directions for use: Cover the bite with ashes or maceration of leaves associated with *Commelina* sp.
 80. *Paspalum conjugatum* BERG. (Poaceae)
Locality: Bunyakiri.
Vernacular name: Kandanda (Kitembo).
Directions for use: Rub the bite with decoction of the whole plant in association of the oil of *Lebrunia bushaie*.
 81. *Pennisetum purpureum* SCHUM. (Poaceae)
Locality: Lwiro, Kabare, Walungu.
Vernacular name: Chibingu (Mashi).
Directions for use: Eat young shoots.
 82. *Pentas deweyrei* WILD. & DUREN (Rubiaceae)
Locality: Lisala, Lwiro.
Vernacular names: Lumale lwiru, Butolya (Mashi).
Directions for use: Squeezed juice drunk.
 83. *Piper capense* LINNE (Piperaceae)
Locality: Lwiro, Bunyakiri.
Vernacular names: Murarabondo, Umubonde (Kitembo), Mushegemankuba (Mashi).
Directions for use: Drink infusion or maceration of the whole plant (use powdered plant).
 84. *Piper umbellatum* LINNE (Piperaceae)

- Locality: Irangi, Lwiro.
 Vernacular names: Mushegemankuba, Mushabankuba (Mashi), Matumbitumbi (Kitembo), Malombo (Lingala), Nombo-nombo (Kikusu), Dilombolombo (Tshilub). Ibilabombo (Kirega).
 Directions for use: Maceration or decoction of leaves or of the whole plant drunk.
85. *Polygala rumenzoriensis* CHODAT (Polygalaceae)
 Locality: Lwiro, Kalengo.
 Vernacular name: Kashorhe (Mashi).
 Directions for use: Maceration of the whole plant against the bite by *Bitis arietans*.
86. *Polygala* sp. (*senega*?) (Polygalaceae)
 Locality: Kalengo. Lwiro, West Africa, Latin America.
 Vernacular name: Kashorhe (Mashi), Kivubula, Nshererhe, Mulongwe (Mashi).
 Directions for use: Maceration of the whole plant against the bite by Viperidae and Crotalidae.
87. *Rauwolfia cambodiana* (perakensis KING & GAMBLE) (Apocynaceae)
 Locality: Walikale.
 Vernacular name: Kalenge (Kitembo).
 Directions for use: Maceration of the whole plant drunk (barks, stem, roots and leaves).
 Cover the feet with extract for repelling the snake.
88. *Rauwolfia heterophylla* WILD. (Apocynaceae)
 Locality: Bunyakiri, Walikale.
 Vernacular name: Kalenge (Kitembo).
 Directions for use: Drink maceration or latex of the whole plant, leaves and stem make a liniment for covering the bite.
89. *Rauwolfia javanica* KOORDERS (Apocynaceae)
 Locality: Walikale, Bunyakiri.
 Vernacular name: Kalenge (Kitembo).
 Directions for use: Drink maceration of the whole plant.
90. *Rauwolfia vomitoria* AFZEL (Apocynaceae)
 Locality: Walikale, Hombo, Irangi.
 Vernacular name: Kalenge (Kitembo).
 Directions for use: Drink maceration of the whole plant.
91. *Rauwolfia serpentina* BENTH. (Apocynaceae)
 Locality: Maniema.
 Vernacular name: Kalenge (Kitembo).
 Directions for use: Drink maceration of the whole plant.
92. *Rubia cordifolia* LINNE (Rubiaceae)
 Locality: Lwiro, Rwanda.
 Vernacular name: Ikarambwe. Ikararambw (Kinyarwanda).
 Directions for use :Drink maceration of the whole plant.
93. *Rubus apetalus* POIR. (Rosaceae)
 Locality: Lwiro. Irangi.
 Vernacular names: Makangahwa (Kitembo), Ikangahwa (Mashi), Umukeri (Kinyarwanda).
 Directions for use: Add water to powder and drink two spoonfuls.
94. *Senecio stuhlmannii* KLATT (Asteraceae)
 Locality: Lwiro.
 Vernacular names: Kalalire, Halire (Mashi).
 Directions for use: Vaccine made with decoction of young leaves.
95. *Setaria chevalieri* STAPF (Poaceae)
 Locality: Irangi, Bunyakiri.
 Vernacular names: Chinyankulu (Mashi), Chooka (Kitembo).
 Directions for use: Rub the bite with decoction of leaves in mixture with *Paspalum conjugatum*.
96. *Setaria megaphylla* DUREN (Poaceae)
 Locality: Irangi.
 Vernacular name: Chooka (Kitembo).
 Directions for use: Add water to powder and drink two spoonfuls.
97. *Sida rhombifolia* LINNE (Malvaceae)
 Locality: Shabunda, Kabare, Walikale.
 Vernacular names: Mudundu (Mashi), Kanjunju (Kirega).
 Directions for use: Vaccine is made with decoction of young leaves.

98. *Spilanthus mauritiana* DC. (Asteraceae)
 Locality: Kabare, Walungu.
 Vernacular name: Chenda (Mashi).
 Directions for use: Vaccine is made with decoction of young leaves.
99. *Sporobolus pyramidalis* BEAUV. (Poaceae)
 Locality: Kivu, Rwanda.
 Vernacular names: Bwikobekobe (Mashi), Shingi (Kihavu).
 Directions for use: Drink maceration of the whole plant or rub the bite with it.
100. *Strophanthus hispidus* DC. (Apocynaceae)
 Locality: Zaire, West Africa.
 Vernacular name: Nyakibishe (Kirega).
 Directions for use: Decoction or maceration of roots and leaves drunk.
101. *Strychnos pungens* SOLERED (Loganiaceae)
 Locality: Kenya, Bunyakiri, Burundi.
 Vernacular names: Umukomo (Kinyarwanda), Ekongo (Kitembo), Umukome (Kirundi).
 Directions for use: Maceration of leaves drunk.
102. *Strychnos* sp. (*hispidus*?) (Loganiaceae)
 Locality: Maniema, Kenya.
 Vernacular name: Ekongo (Kitembo).
 Directions for use: Drink maceration of leaves.
103. *Strychnos spinosa* LAM. (Loganiaceae)
 Locality: Senegal, Kenya, Maniema, Bunyakiri.
 Vernacular names: Ekongo (Kitembo), Patekoulei (Socé).
 Directions for use: Drink maceration of leaves.
104. *Ureia cameroonensis* WEDD. (Urticaceae)
 Locality: Kivu; Kisantu, Rumangabo.
 Vernacular names: Kakalangira (Mashi), Cishi (Kitembo), Bototo (Lingala).
 Directions for use: Masticate leaves or rub the bite with maceration of the whole plant.
105. *Ureia hypselodendron* WEDD. (Urticaceae)
 Locality: Irangi, Bunyakiri.
 Vernacular name: Chishi (Kitembo).
 Directions for use: Masticate leaves or rub the bite with maceration of the whole plant.
106. *Ureia* sp. (*repens*?) (Urticaceae)
 Locality: Bunyakiri.
 Vernacular name: Chishi (Kitembo).
 Directions for use: Masticate the leaves or drink the maceration (two spoonfuls).
107. *Urtica massaiica* MILDBR (Urticaceae)
 Locality: Beni, Kabare.
 Vernacular names: Isusa, Igisura, Umusasa, Ikiboroza (Kinyarwanda), Nshusha (Mashi).
 Directions for use: Eat the cooked leaves.
108. *Vernonia conferta* BENTH. (Asteraceae)
 Locality: Lwiro, Bunyakiri.
 Vernacular names: Ifumu, Chishorhe, Igaragara, Ivumo (Mashi).
 Directions for use: Vaccine is made with decoction of young leaves.
109. *Zehneria scabra* SOND. (Cucurbitaceae)
 Locality: Zaire, East Africa.
 Vernacular name: Fsuiza (Shambaa).
 Directions for use: Cover the bite with ashes.
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The use of plant drugs varies from one species to another, from tribe to tribe and according to the type of envenomation.

Part of plant used: The part used depends on the structure of the plant. For trees and shrubs, barks and roots are used. Sometimes leaves, fruits and flowers are collected. For herbaceous plants, the whole plant is used.

The collecting be done in the morning, in the evening, in the daytime or in the night. The collecting moment varies from tribe to tribe and from one medicine man to another.

Do not drink water in a river without using a container.

Take the plant with the left hand quickly.

Take the plant after pronouncing the magic formulas.

The collecting rules: Special rules of collecting must be observed as follows:

Preparation and application of drugs: The methods by which the drugs are prepared and applied are as follows:

Decoction: vegetal materials are boiled and the resulting decoction is used orally.

Infusion and maceration: parts of plants are crushed, triturated and mixed with water. After filtration, the macerated plant is orally or externally administered to the victim.

Ashes: the plant are calcined and the resulting ashes are applied to the bite.

Powder: the plants or their parts are dried and reduced to fine powder which can be applied to the bite or used orally after adding water to it.

Mastication: leaves or young shoots are chewed and the juice is swallowed.

Expressed juice: vegetal materials are triturated and the juice is extracted. This fresh juice is used orally or applied to the bite.

Mixture: mixture of plants and animal materials (oil, fat, skin, tooth, tail and venom) is prepared for external application. Fat and oil are used as binding material when the ointment is prepared. Sometimes savoury liquids are added (milk, beer, fruit juice, salt, tea and sugar) for internal use.

Specific action of plant drugs on envenomation: The plant drugs are used in order to stop and to eliminate the venom. The mechanism of their action is not yet known. Possibly the active principle reacts like an enzyme by competition, inhibition and destruction of the venom. The antivenomous plants are classified according to the type of envenomation. The following categories are actually recorded:

(a) Ophiocid plant: extract of *Crassocephalum vitellinum* can kill a snake.

(b) Protective plants: Use as a bracelet or mastication of the following plants protects against snake bites: *Crinum ornatum*, *Haemanthus* sp., *Anthericum elgonense*, *Commelina* sp., *Dichrostachys nutans* and *Dichrostachys glomerata*.

(c) Repulsive plants: extract of these plants repels the snake: *Rauwolfia vomitoria*, *Strophanthus hispidus*, *Asparagus africanus* and *Melanthera brownei*.

(d) Plants used for immunization: vaccine is made with decoction of the following plants: *Funtumia elastica*, *Amaranthus aspera*, *Hibiscus cannabinus*, *Kalanchoe integra*, *Vernonia conferta*, *Hugonia platysepala*, *Spilanthes mauritiana*, *Bidens pilosa*, *Oxalis corniculata*, *Sida rhombifolia*, *Dyschoriste perrotetii*, *Desmodium adscendens*, *Anthericum elgonense*, *Annona senegalensis* and *Melothria punctata*.

(e) Curative plants: these plants are immediately used after snake bite for treating the wound and stopping the envenomation. Two categories are distinguished:

Curative plants with specific action:

Anti-inflammatory-necrosis-oedema and cicatrizant plants: (Anti-Bitis), *Cissampelos mucronata*.

Anti-Boulengerina: *Chomelia laurentii*.

Anti-Bitis arietans: *Polygal: senega*, *Rubus apetalus*.

Anti-Atheris-Atractaspis-Causus-Bitis: *Rubus apetalus*.

Anti-Dendroaspis: *Brillantaisia cicatricosa*, *Cassia occidentalis* and *Urtica massaica*.

Anti-Naja (against paralysis): *Brillantaisia cicatricosa*.

Curative plants with polyvalent actions: these plants are used against all kinds of venomous snakes.

(f) Formulas made by association or mixture of many plants: two to nine plants can be associated for treating the envenomation.

Plant species and directions for use: Ethnobotanical inquiries were made to collect local plants, their vernacular names and the directions for use of each plant. The use of drugs varies from one plant species to another and from one medicine man to another.

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